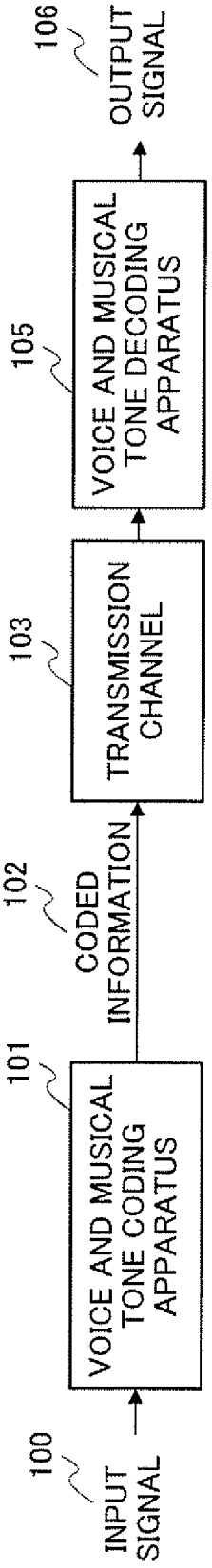
100
INPUT SIGNAL
101
VOICE AND MUSICAL TONE CODING APPARATUS
102
CODED INFORMATION
103
TRANSMISSION CHANNEL
105
VOICE AND MUSICAL TONE DECODING APPARATUS
106
OUTPUT SIGNAL

FIG.1

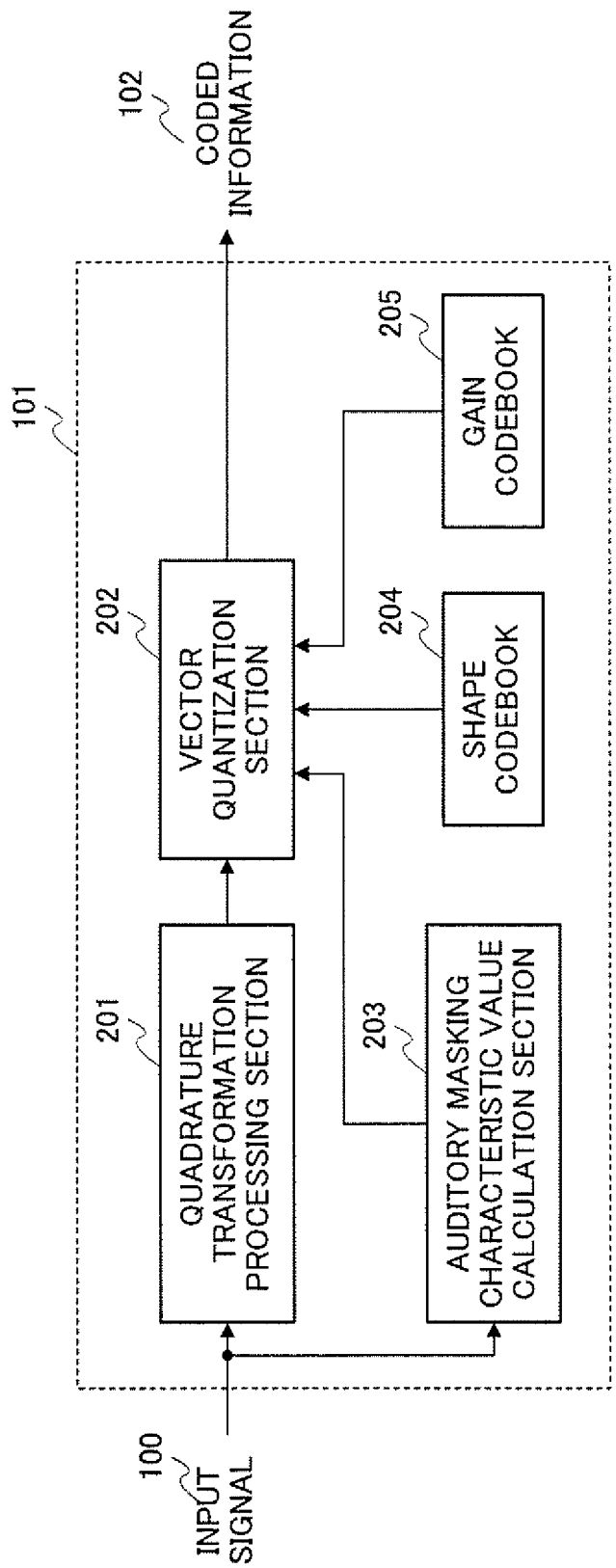
100
INPUT SIGNAL
101
102
CODED INFORMATION
201
QUADRATURE TRANSFORMATION PROCESSING SECTION
202
VECTOR QUANTIZATION SECTION
203
AUDITORY MASKING CHARACTERISTIC VALUE CALCULATION SECTION
204
SHAPE CODEBOOK
205
GAIN CODEBOOK

FIG.2

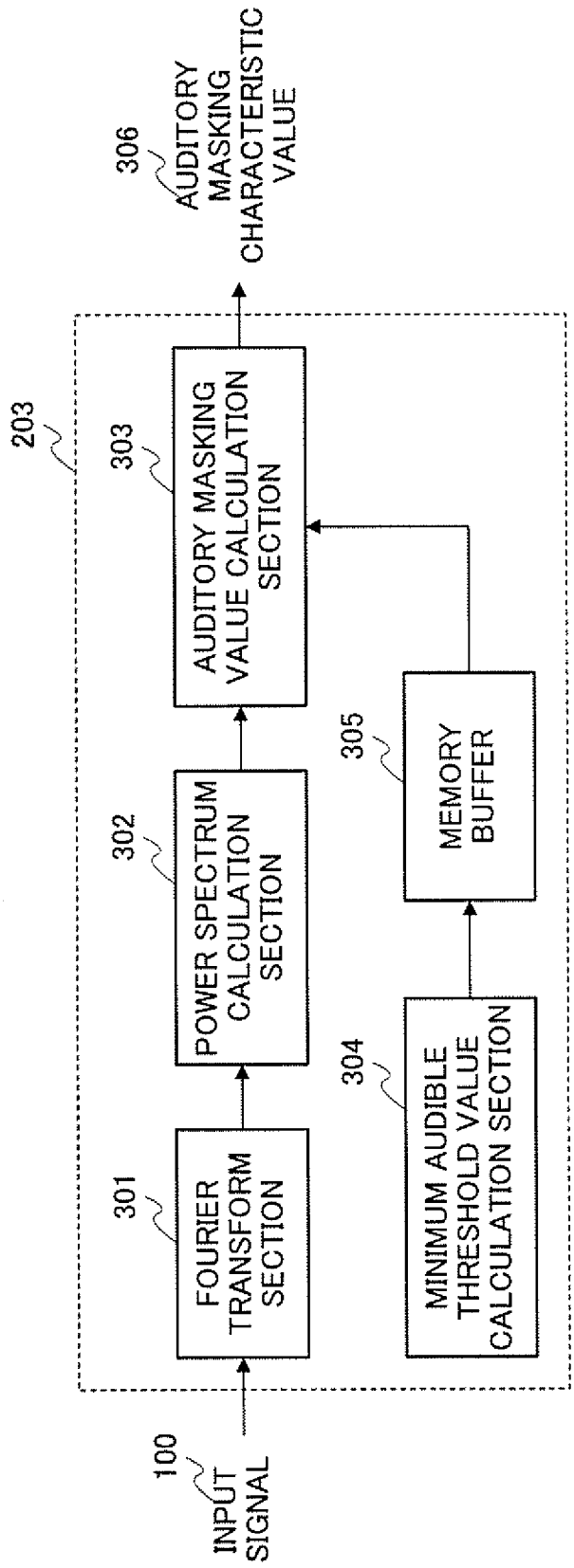
100
INPUT SIGNAL
203
301
FOURIER TRANSFORM SECTION
302
POWER SPECTRUM CALCULATION SECTION
303
AUDITORY MASKING VALUE CALCULATION SECTION
304
MINIMUM AUDIBLE THRESHOLD VALUE CALCULATION SECTION
305
MEMORY BUFFER
306
AUDITORY MASKING CHARACTERISTIC VALUE

FIG.3

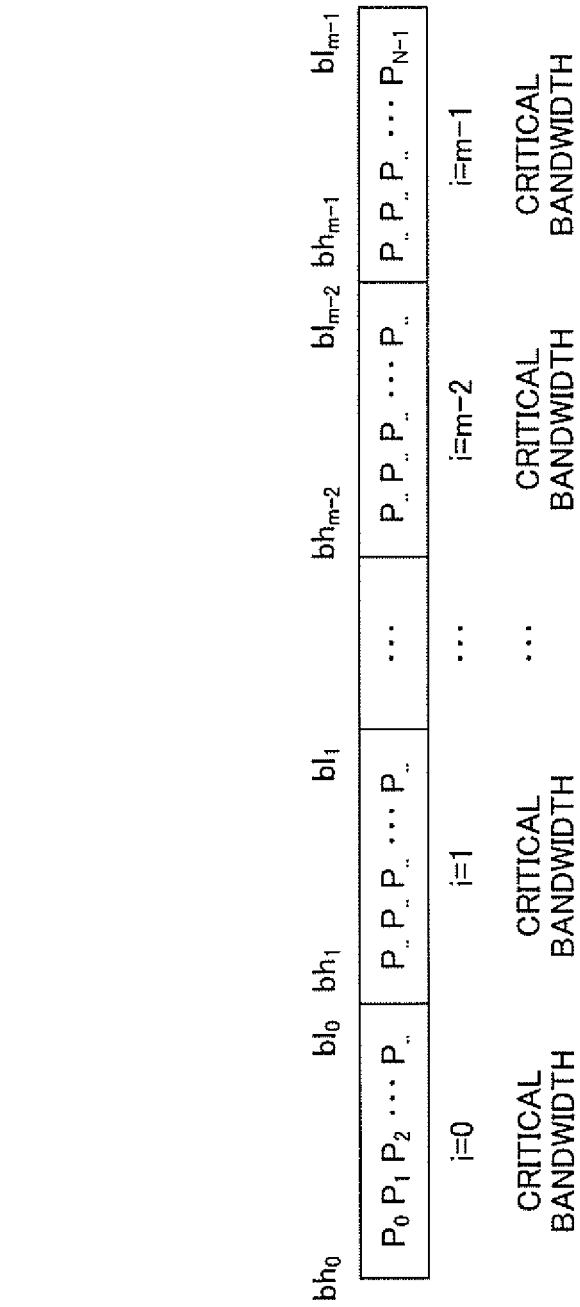
bh_0
bl_0
bh_1
bl_1
bh_{m-2}
bl_{m-2}
bh_{m-1}
bl_{m-1}
P_0 P_1 P_2 ··· $P_{..}$
$P_{..}$ $P_{..}$ $P_{..}$ ··· $P_{..}$
$P_{..}$ $P_{..}$ $P_{..}$ ··· $P_{..}$
$P_{..}$ $P_{..}$ $P_{..}$ ··· P_{N-1}
i=0
i=1
i=m−2
i=m−1
CRITICAL BANDWIDTH
CRITICAL BANDWIDTH
CRITICAL BANDWIDTH
CRITICAL BANDWIDTH

FIG.4

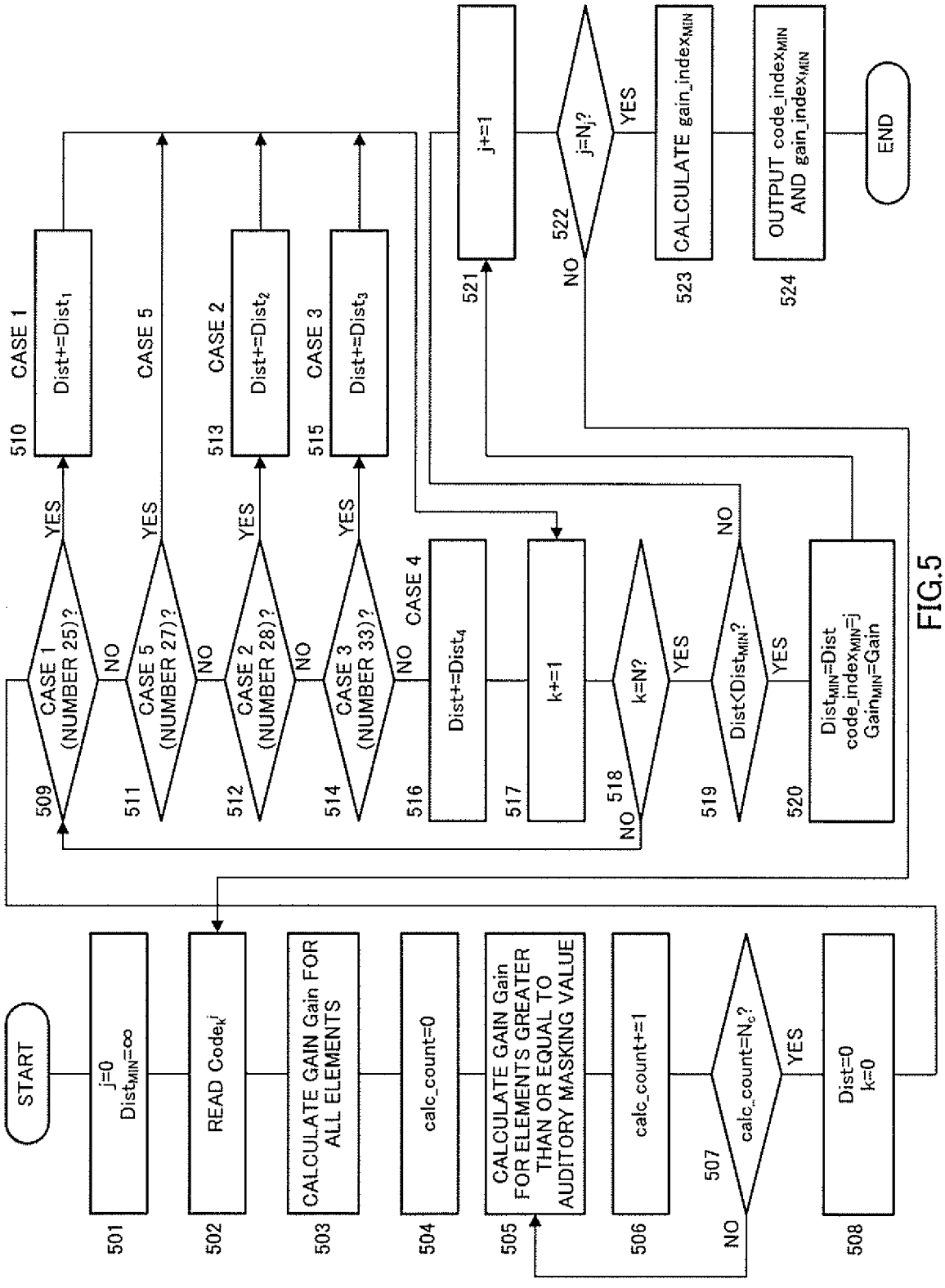
START
501 j=0 Dist_MIN=∞
502 READ Code_k^j
503 CALCULATE GAIN Gain FOR ALL ELEMENTS
504 calc_count=0
505 CALCULATE GAIN Gain FOR ELEMENTS GREATER THAN OR EQUAL TO AUDITORY MASKING VALUE
506 calc_count+=1
507 calc_count=N_c?
NO
YES
508 Dist=0 k=0
509 CASE 1 (NUMBER 25)?
510 CASE 1 Dist+=Dist_1
511 CASE 5 (NUMBER 27)?
CASE 5
512 CASE 2 (NUMBER 28)?
513 CASE 2 Dist+=Dist_2
514 CASE 3 (NUMBER 33)?
515 CASE 3 Dist+=Dist_3
516 CASE 4 Dist+=Dist_4
517 k+=1
518 k=N?
519 Dist<Dist_MIN?
520 Dist_MIN=Dist code_index_MIN=j Gain_MIN=Gain
521 j+=1
522 j=N_j?
523 CALCULATE gain_index_MIN
524 OUTPUT code_index_MIN AND gain_index_MIN
END

FIG.5

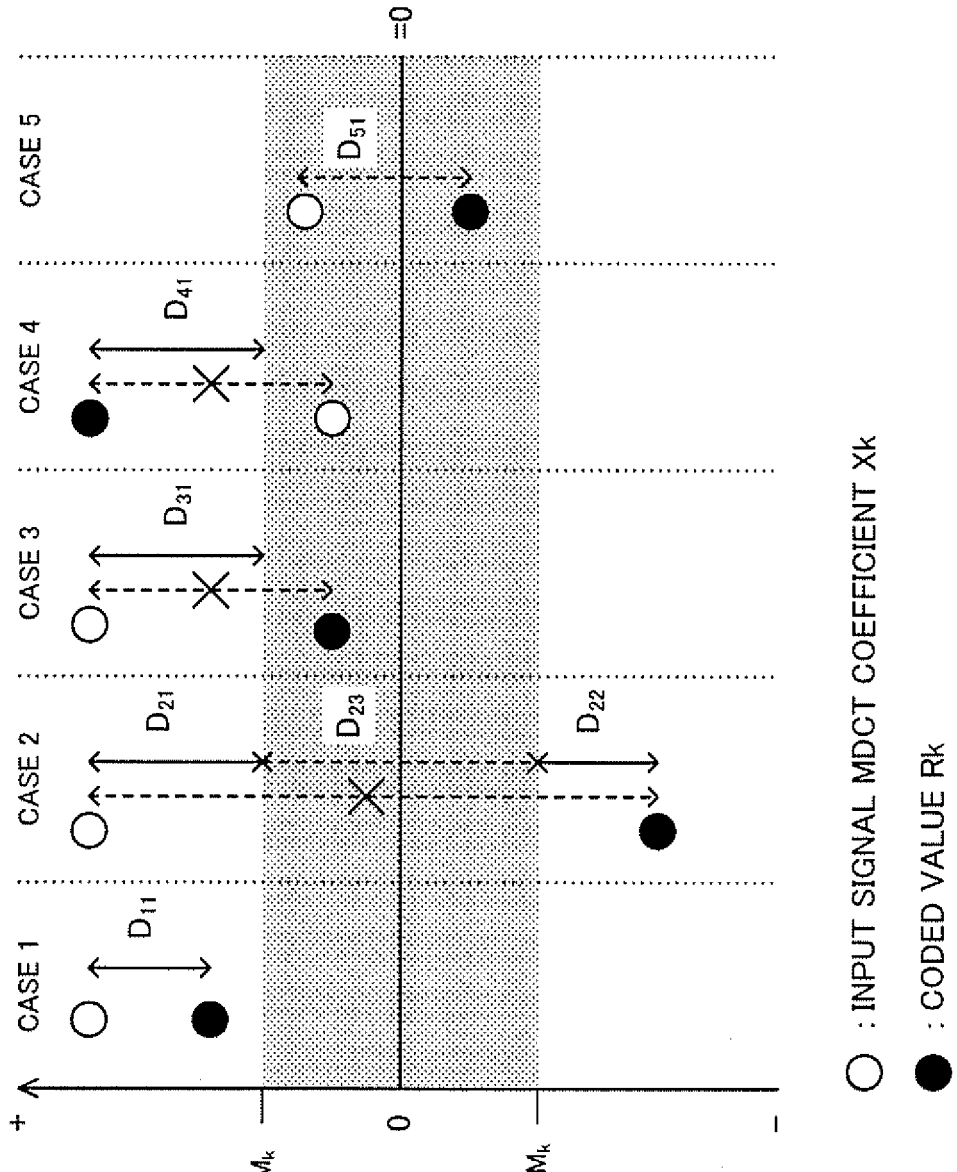
CASE 1
CASE 2
CASE 3
CASE 4
CASE 5
D11
D21
D23
D22
D31
D41
D51
+
0
-
Mk
-Mk
=0
AUDITORY MASKING CHARACTERISTIC VALUE
: INPUT SIGNAL MDCT COEFFICIENT Xk
: CODED VALUE Rk

FIG.6

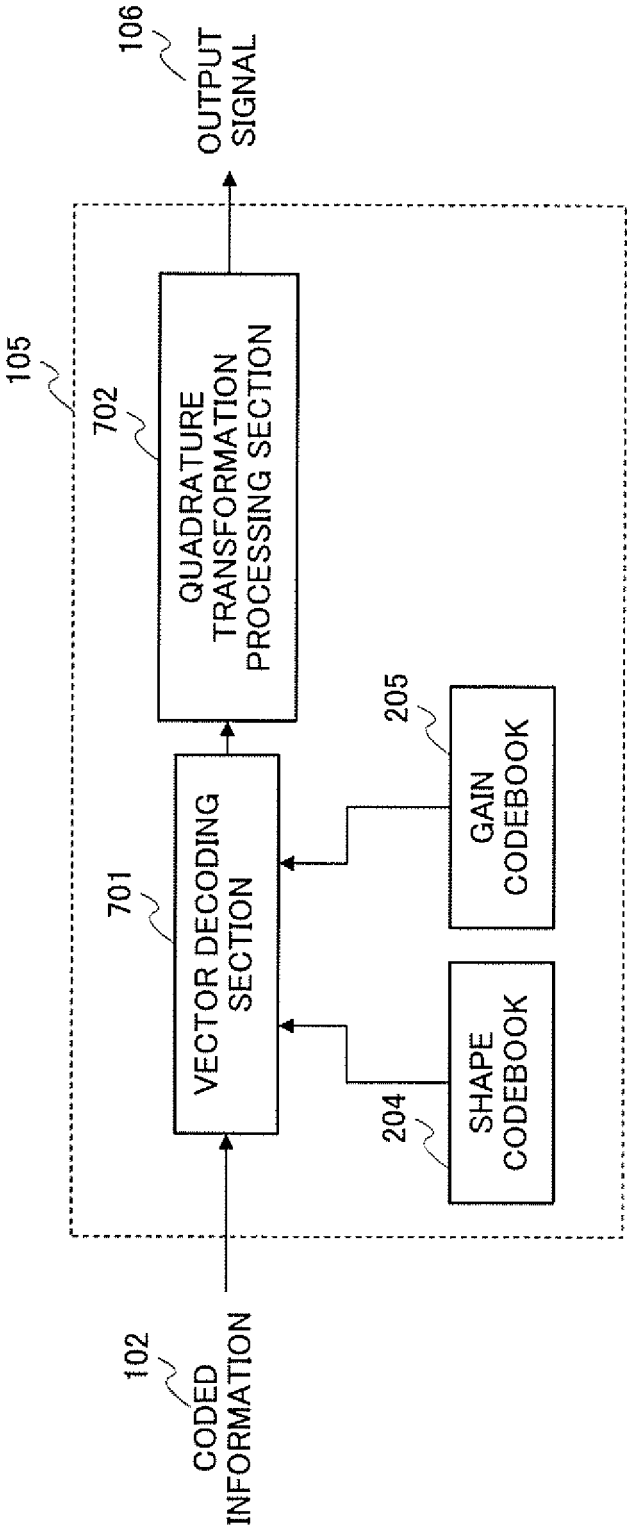
102
CODED INFORMATION
105
701
VECTOR DECODING SECTION
204
SHAPE CODEBOOK
205
GAIN CODEBOOK
702
QUADRATURE TRANSFORMATION PROCESSING SECTION
106
OUTPUT SIGNAL

FIG.7

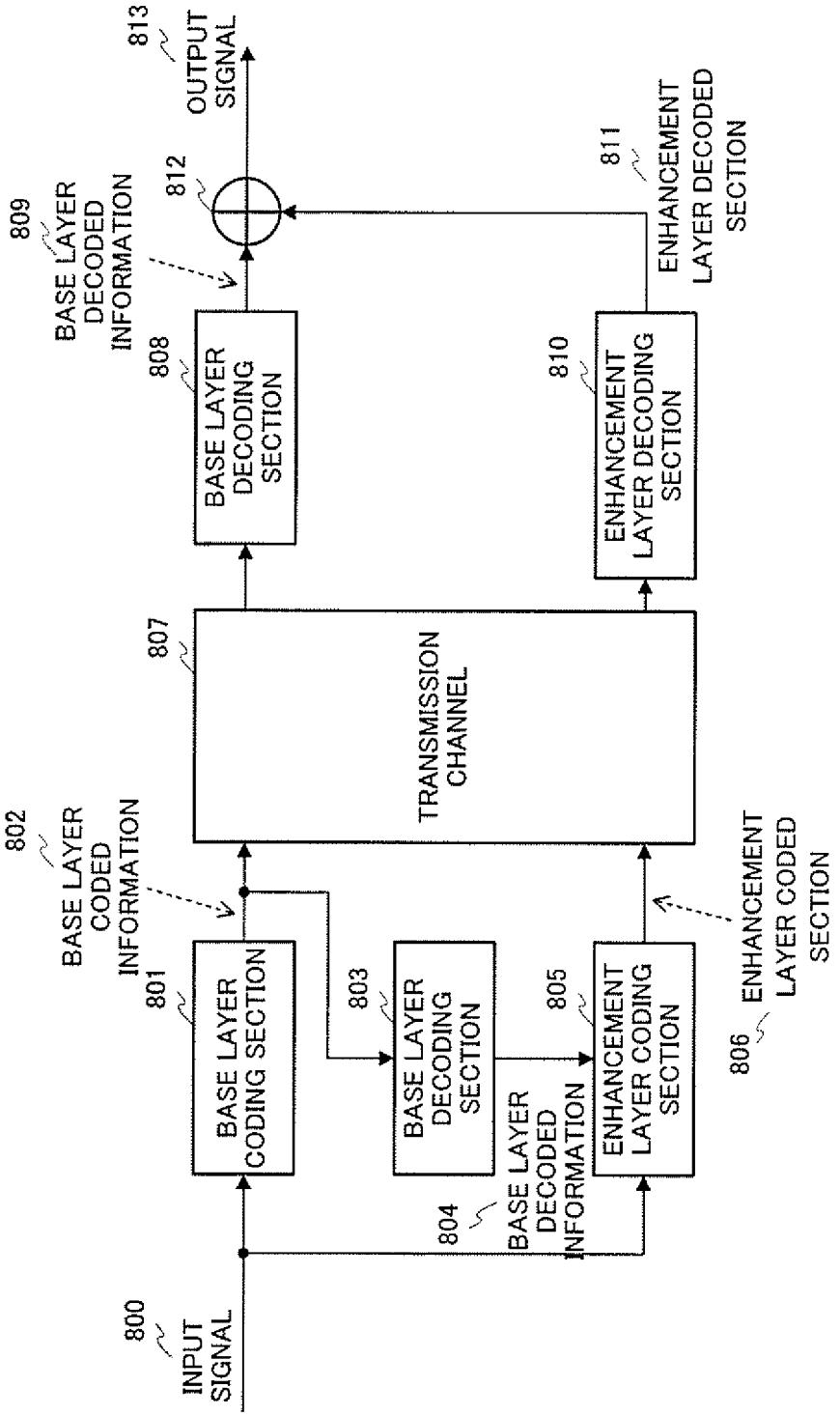
800
INPUT SIGNAL
801
BASE LAYER CODING SECTION
802
BASE LAYER CODED INFORMATION
803
BASE LAYER DECODING SECTION
804
BASE LAYER DECODED INFORMATION
805
ENHANCEMENT LAYER CODING SECTION
806
ENHANCEMENT LAYER CODED SECTION
807
TRANSMISSION CHANNEL
808
BASE LAYER DECODING SECTION
809
BASE LAYER DECODED INFORMATION
810
ENHANCEMENT LAYER DECODING SECTION
811
ENHANCEMENT LAYER DECODED SECTION
812
813
OUTPUT SIGNAL

FIG.8

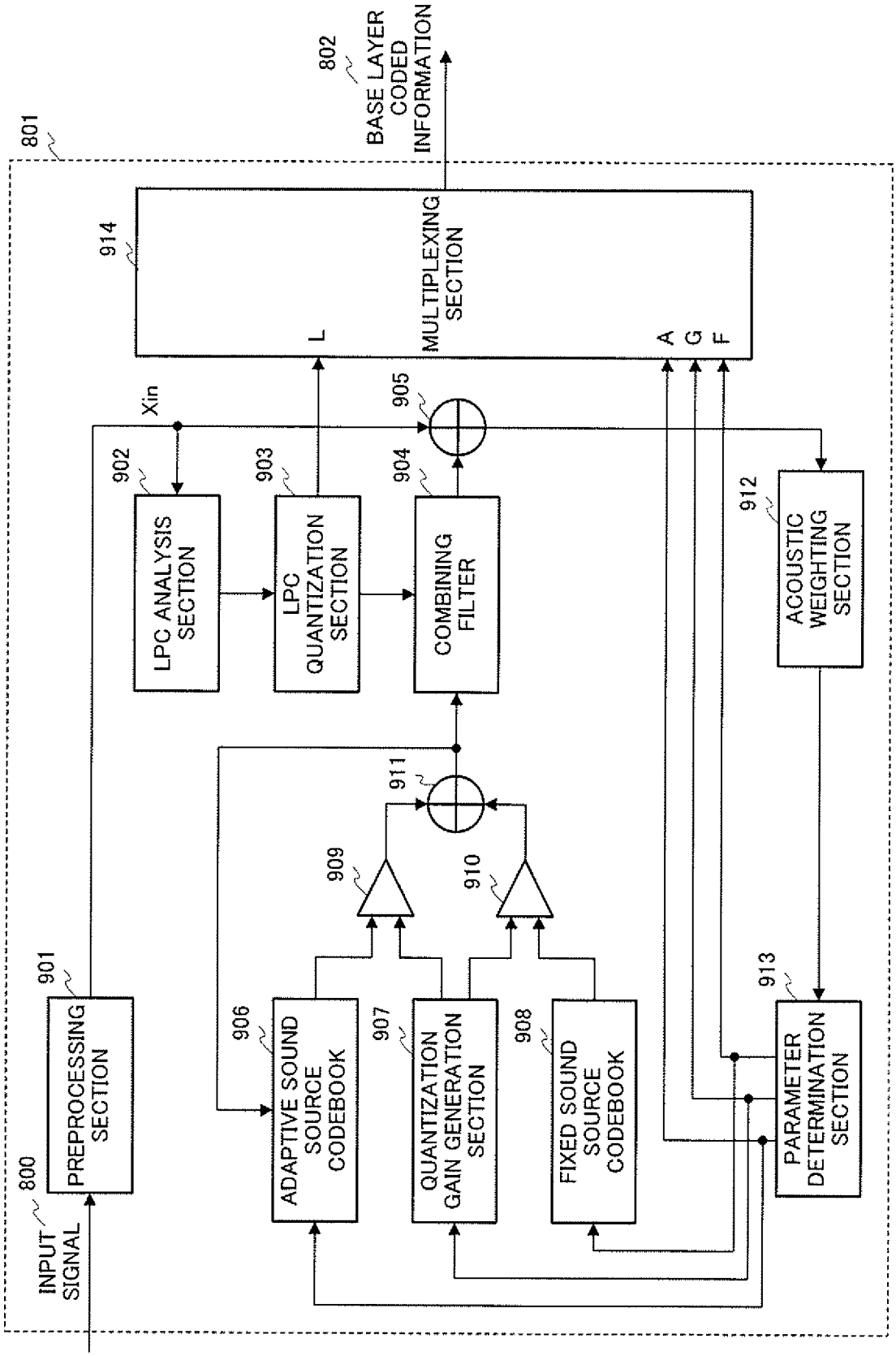
INPUT SIGNAL
800
PREPROCESSING SECTION
901
801
802
BASE LAYER CODED INFORMATION
914
MULTIPLEXING SECTION
L
A
G
F
Xin
902
LPC ANALYSIS SECTION
903
LPC QUANTIZATION SECTION
904
COMBINING FILTER
905
912
ACOUSTIC WEIGHTING SECTION
911
909
910
906
ADAPTIVE SOUND SOURCE CODEBOOK
907
QUANTIZATION GAIN GENERATION SECTION
908
FIXED SOUND SOURCE CODEBOOK
913
PARAMETER DETERMINATION SECTION

FIG.9

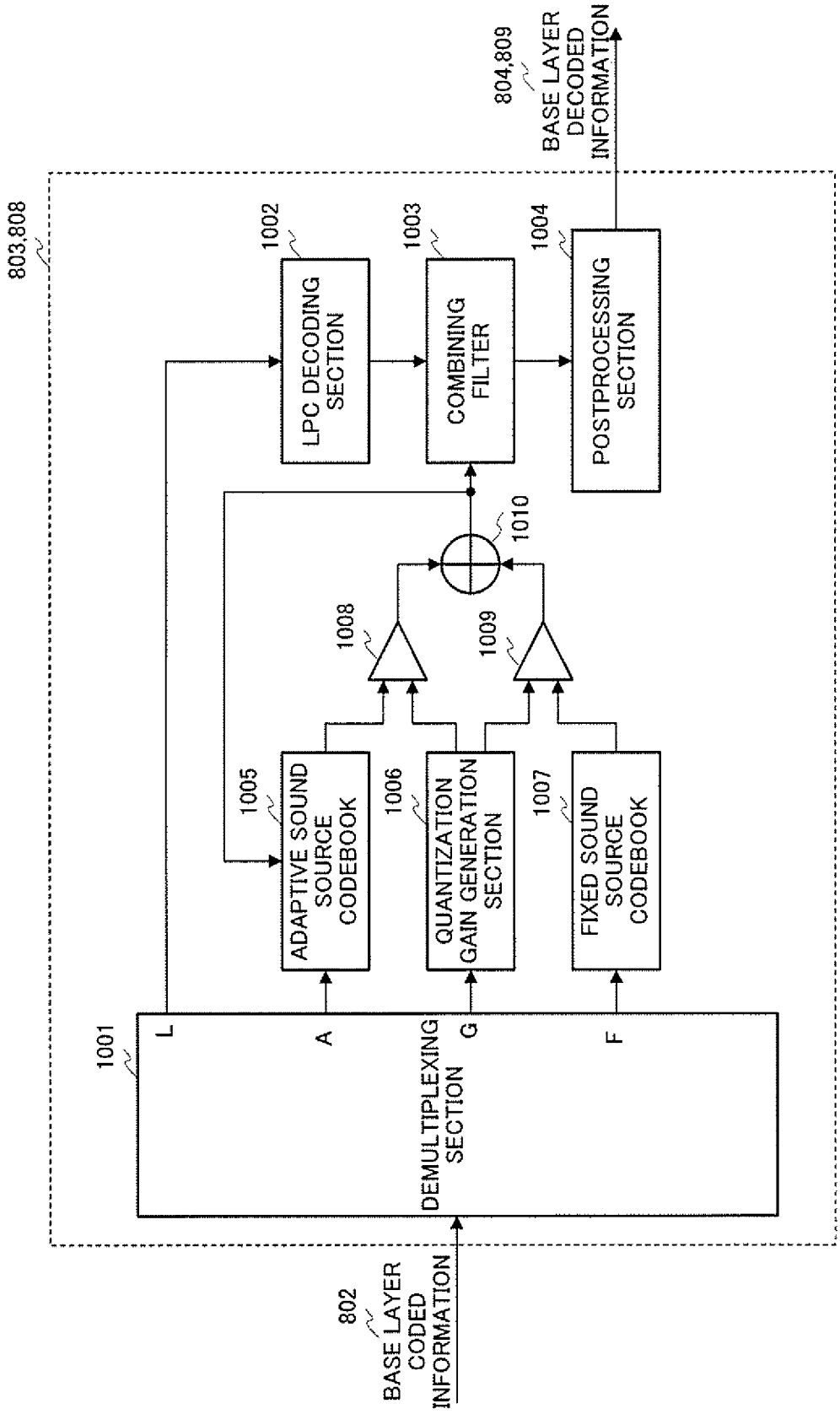
803,808
804,809
BASE LAYER DECODED INFORMATION
1002
LPC DECODING SECTION
1003
COMBINING FILTER
1004
POSTPROCESSING SECTION
1010
1008
1009
1005
ADAPTIVE SOUND SOURCE CODEBOOK
1006
QUANTIZATION GAIN GENERATION SECTION
1007
FIXED SOUND SOURCE CODEBOOK
1001
DEMULTIPLEXING SECTION
L
A
G
F
802
BASE LAYER CODED INFORMATION

FIG.10

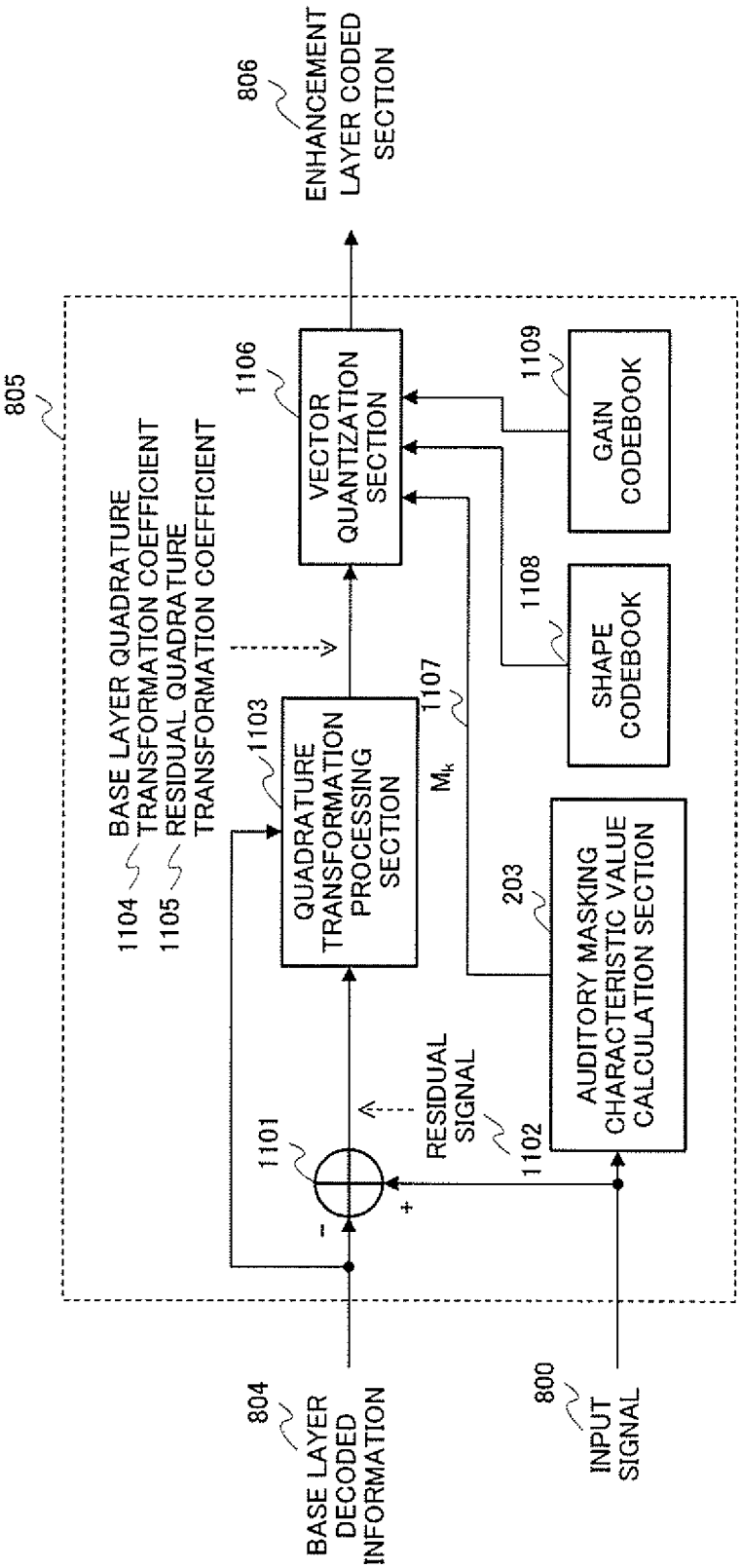
806
ENHANCEMENT LAYER CODED SECTION
805
1106
VECTOR QUANTIZATION SECTION
1109
GAIN CODEBOOK
1104 BASE LAYER QUADRATURE TRANSFORMATION COEFFICIENT
1105 RESIDUAL QUADRATURE TRANSFORMATION COEFFICIENT
1103
QUADRATURE TRANSFORMATION PROCESSING SECTION
1107
M_k
1108
SHAPE CODEBOOK
203
AUDITORY MASKING CHARACTERISTIC VALUE CALCULATION SECTION
1101
RESIDUAL SIGNAL
1102
804
BASE LAYER DECODED INFORMATION
800
INPUT SIGNAL

FIG.11

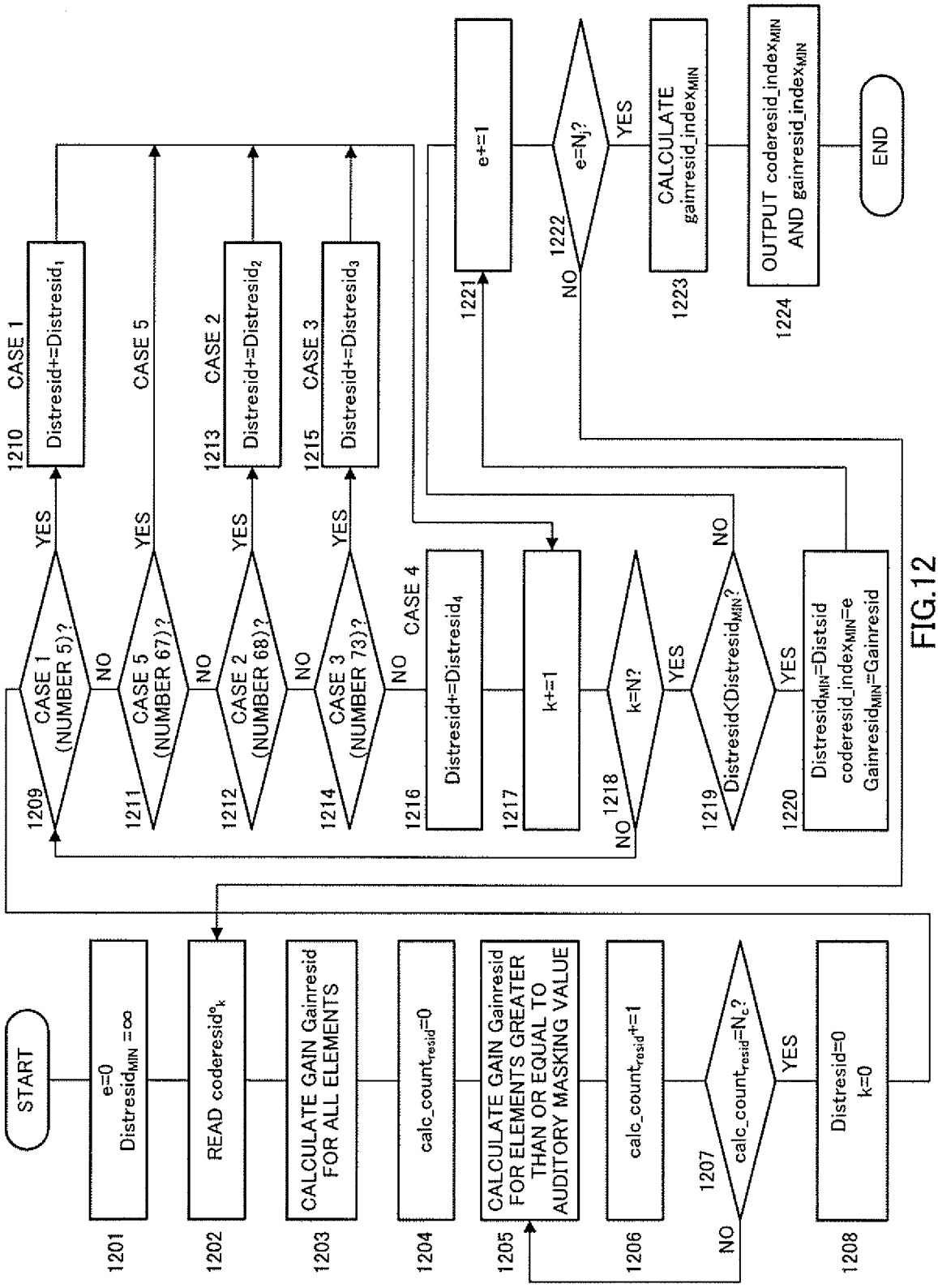
START
1201 e=0 Distresid_MIN =∞
1202 READ coderesid^e_k
1203 CALCULATE GAIN Gainresid FOR ALL ELEMENTS
1204 calc_count_resid=0
1205 CALCULATE GAIN Gainresid FOR ELEMENTS GREATER THAN OR EQUAL TO AUDITORY MASKING VALUE
1206 calc_count_rasid+=1
1207 calc_count_resid=N_c?
NO
YES
1208 Distresid=0 k=0
1209 CASE 1 (NUMBER 5)?
YES
1210 CASE 1 Distresid+=Distresid_1
NO
1211 CASE 5 (NUMBER 67)?
YES
CASE 5 Distresid+=Distresid_5
NO
1212 CASE 2 (NUMBER 68)?
YES
1213 CASE 2 Distresid+=Distresid_2
NO
1214 CASE 3 (NUMBER 73)?
YES
1215 CASE 3 Distresid+=Distresid_3
NO
CASE 4
1216 Distresid+=Distresid_4
1217 k+=1
1218 k=N?
NO
YES
1219 Distresid<Distresid_MIN?
NO
YES
1220 Distresid_MIN=Distsid coderesid_index_MIN=e Gainresid_MIN=Gainresid
1221 e+=1
1222 e=N_j?
NO
YES
1223 CALCULATE gainresid_index_MIN
1224 OUTPUT coderesid_index_MIN AND gainresid_index_MIN
END

FIG.12

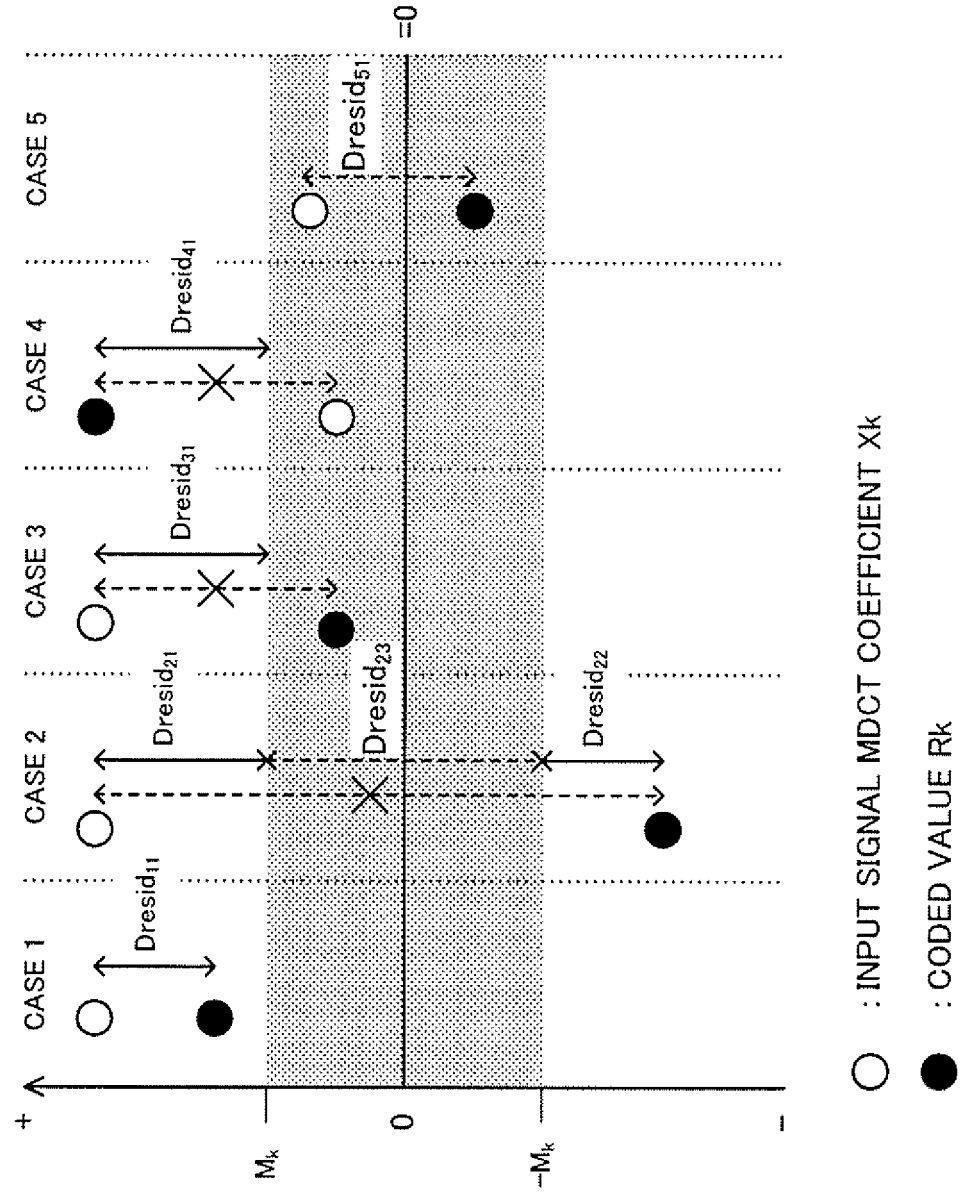
INPUT SIGNAL AUDITORY MASKING CHARACTERISTIC VALUE
+
-
0
M_k
$-M_k$
=0
CASE 1
CASE 2
CASE 3
CASE 4
CASE 5
$Dresid_{11}$
$Dresid_{21}$
$Dresid_{22}$
$Dresid_{23}$
$Dresid_{31}$
$Dresid_{41}$
$Dresid_{51}$
: INPUT SIGNAL MDCT COEFFICIENT Xk
: CODED VALUE Rk

FIG.13

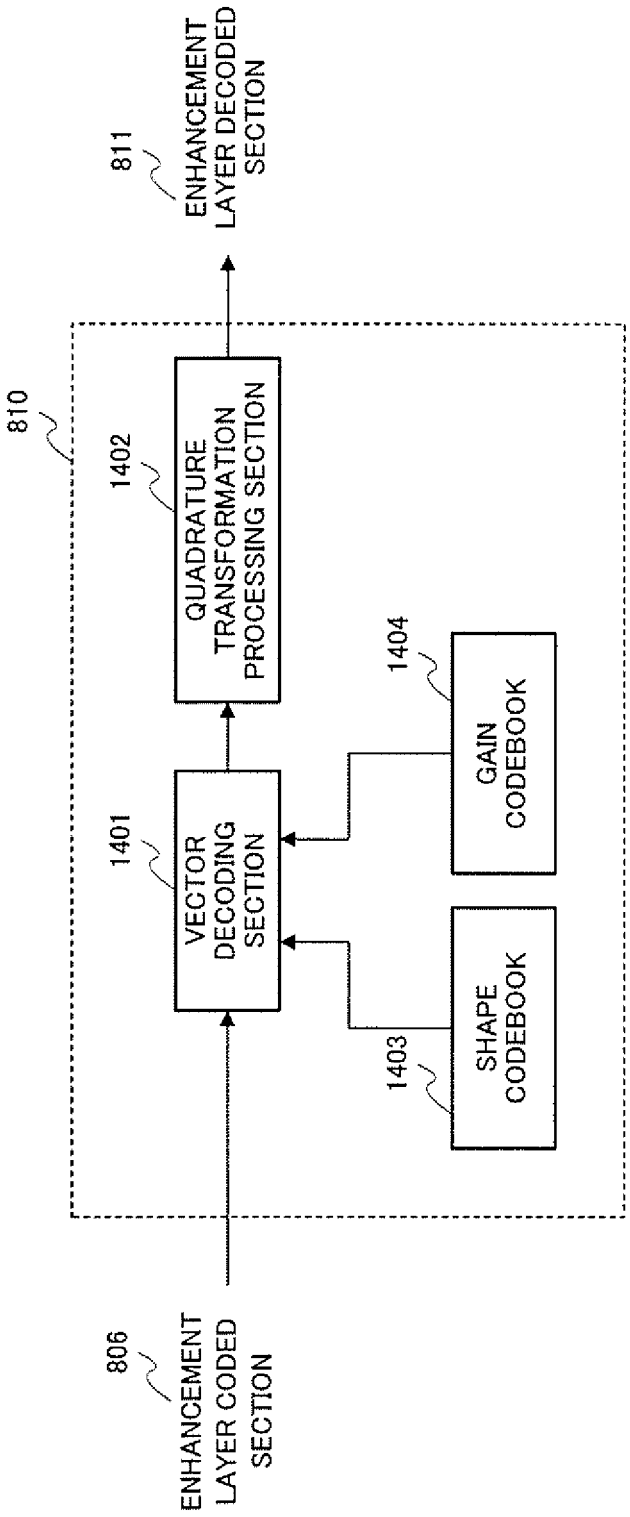
806
ENHANCEMENT LAYER CODED SECTION
810
1401
VECTOR DECODING SECTION
1402
QUADRATURE TRANSFORMATION PROCESSING SECTION
811
ENHANCEMENT LAYER DECODED SECTION
1403
SHAPE CODEBOOK
1404
GAIN CODEBOOK

FIG.14

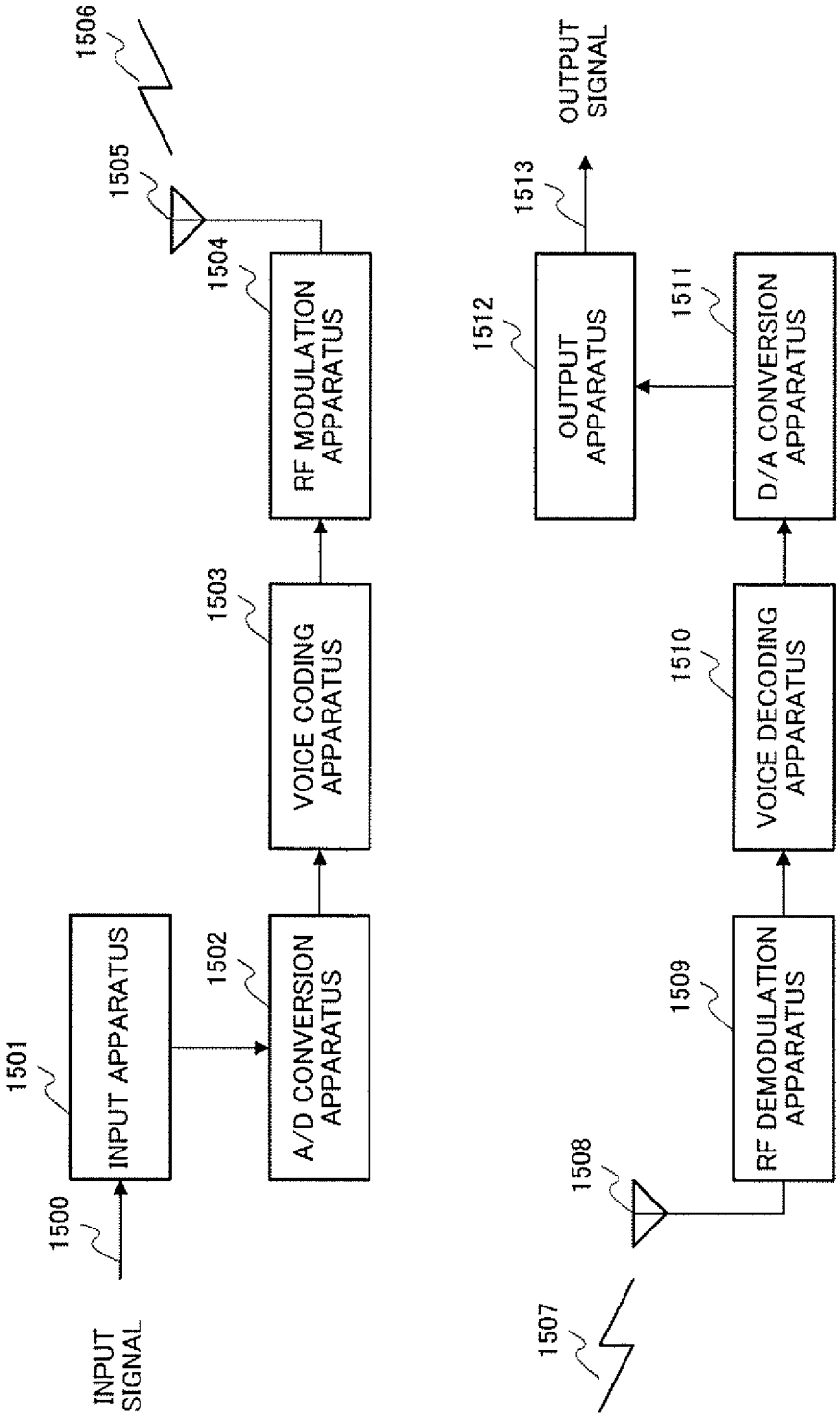
INPUT SIGNAL
1500
1501
INPUT APPARATUS
1502
A/D CONVERSION APPARATUS
1503
VOICE CODING APPARATUS
1504
RF MODULATION APPARATUS
1505
1506
1507
1508
RF DEMODULATION APPARATUS
1509
1510
VOICE DECODING APPARATUS
1511
D/A CONVERSION APPARATUS
1512
OUTPUT APPARATUS
1513
OUTPUT SIGNAL

FIG.15

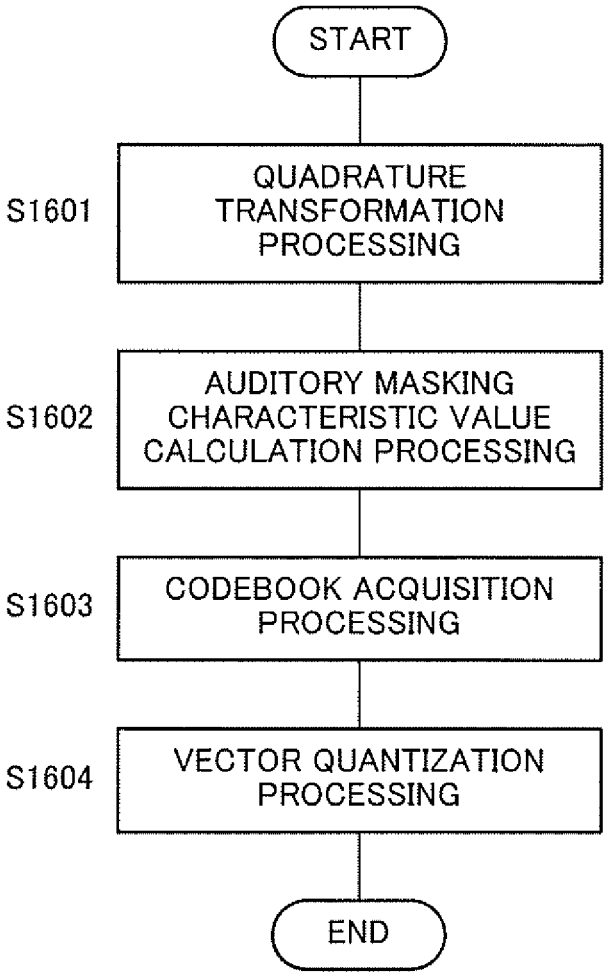
START
S1601
QUADRATURE TRANSFORMATION PROCESSING
S1602
AUDITORY MASKING CHARACTERISTIC VALUE CALCULATION PROCESSING
S1603
CODEBOOK ACQUISITION PROCESSING
S1604
VECTOR QUANTIZATION PROCESSING
END

FIG.16

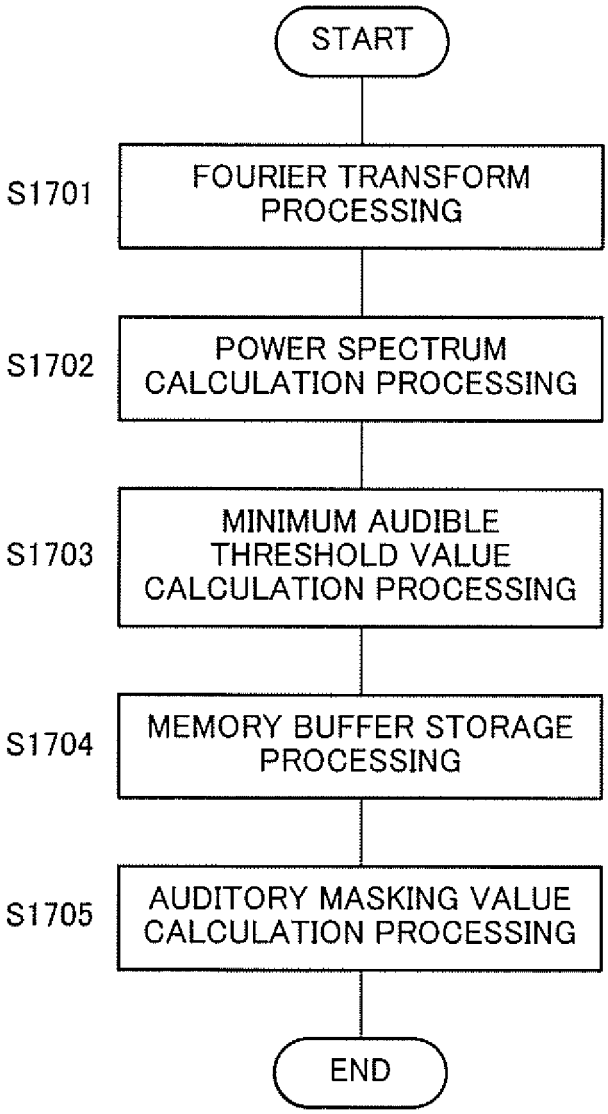
START
S1701
FOURIER TRANSFORM PROCESSING
S1702
POWER SPECTRUM CALCULATION PROCESSING
S1703
MINIMUM AUDIBLE THRESHOLD VALUE CALCULATION PROCESSING
S1704
MEMORY BUFFER STORAGE PROCESSING
S1705
AUDITORY MASKING VALUE CALCULATION PROCESSING
END

FIG.17